

Claims

- [c1] 1. A computer network that comprises:
one or more I/O devices on which data may be stored in files; and
multiple computers coupled together, with each computer including a system memory having a plurality of caches with different bucket sizes,
wherein each of the multiple computers is configured to cache data from the one or more I/O devices in the plurality of caches, and
wherein each cache in the plurality of caches is capable of caching data from multiple files stored on the one or more I/O devices.
- [c2] 2. The computer network of claim 1, wherein each cache in the plurality of caches stores data from multiple files.
- [c3] 3. The computer network of claim 1, wherein the one or more I/O devices include at least one hard disk drive.
- [c4] 4. The computer network of claim 1, wherein each computer is configured to cache said data in system memory using at least three caches with different bucket sizes.

- [c5] 5. The computer network of claim 1, wherein additional computers may join the network, and wherein each of the multiple computers is configured to monitor which computers in the network are configured to cache said data.
- [c6] 6. The computer network of claim 5, wherein each of the multiple computers is configured to determine a remote connection address to all other computers in the network that are configured to cache said data.
- [c7] 7. The computer network of claim 6, wherein each of the multiple computers is further configured to send and receive targeted messages for maintaining cache coherency.
- [c8] 8. The computer network of claim 5, wherein each of the multiple computers is further configured to determine a list of computers in the network that are configured to cache said data, and configured to update the list when additional computers join the network.
- [c9] 9. A computer network that comprises:
one or more I/O devices capable of storing data in a file;
and
multiple computers coupled together, with each computer including a system memory having multiple caches

with different bucket sizes, and wherein each of the multiple caches is capable of caching data from said file.

- [c10] 10. The computer network of claim 9, wherein each computer caches said data in system memory using at least three caches with different bucket sizes.
- [c11] 11. The computer network of claim 9, wherein computers may join the network, and wherein each of said multiple computers monitors which computers in the network are configured to cache said data.
- [c12] 12. The computer network of claim 11, wherein each of the multiple computers determine a remote connection address to all other computers in the network that are configured to cache said data.
- [c13] 13. The computer network of claim 12, wherein each of the multiple computers sends and receives targeted messages for maintaining cache coherency.
- [c14] 14. A cache driver to be executed by each of multiple computers coupled together in a network with at least one I/O device on which data may be stored in files, each of said multiple computers having an associated system memory, wherein the cache driver comprises:
code to create in the associated system memory at least

two caches having different bucket sizes, wherein each cache is capable of caching data from multiple files stored on said I/O device; and
a routine that configures the computer to use said caches to cache data from said I/O device.

[c15] 15. The cache driver of claim 14, further comprising:
code that configures the computer to maintain cache coherency by using targeted messages to invalidate remotely cached copies of data that has been modified.

[c16] 16. The cache driver of claim 14, further comprising:
code that configures the computer to determine which computers in the network are configured to cache said data.

[c17] 17. The cache driver of claim 14, further comprising:
code that configures the computer to determine a list of computers that are configured to cache said data, and
further configures the computer to update the list after a computer that is configured to cache said data joins the network.

[c18] 18. The cache driver of claim 17, further comprising:
code that configures the computer to determine a remote connection address for each computer in the list.

[c19] 19. The cache driver of claim 14, wherein the at least

one I/O device comprises at least one hard disk drive.

- [c20] 20. The cache driver of claim 14, wherein the cache driver configures each of the multiple computers to create in their associated system memory at least three caches having different bucket sizes.
- [c21] 21. A cache driver to be executed by each of multiple computers coupled together in a network with at least one I/O device on which data may be stored in files, each of said multiple computers having an associated system memory, wherein the cache driver comprises:
code to create in the associated system memory at least two caches having different bucket sizes, wherein each cache is capable of caching data from a given file stored on said I/O device; and
a routine that configures the computer to use said caches to cache data from said I/O device.
- [c22] 22. The cache driver of claim 21, further comprising:
code that configures the computer to maintain cache coherency by using targeted messages to invalidate remotely cached copies of data that has been modified.
- [c23] 23. The cache driver of claim 21, further comprising:
code that configures the computer to determine which computers in the network are configured to cache said

data.

- [c24] 24. The cache driver of claim 21, further comprising:
code that configures the computer to determine a list of
computers that are configured to cache said data, and
further configures the computer to determine a remote
connection address for each computer in the list.
- [c25] 25. A method of caching data from an I/O device that is
coupled to a computer that includes a system memory,
wherein the I/O device stores said data in multiple files,
wherein the method comprises:
creating in system memory at least two caches with dif-
ferent bucket sizes; and
caching in each of the two caches data from multiple
files stored on the I/O device.
- [c26] 26. The method of claim 25, wherein the I/O device is a
hard disk drive.
- [c27] 27. The method of claim 25, wherein said creating in-
cludes creating three caches with different bucket sizes.
- [c28] 28. A method of caching data from a file on at least one
I/O device that is coupled to a computer having a system
memory, wherein the method comprises:
creating in system memory at least two caches with dif-
ferent bucket sizes; and

caching in each of the two caches data from said file.

[c29] 29. The method of claim 28, wherein the at least one I/O device comprises a hard disk drive.

[c30] 30. The method of claim 28, wherein said creating includes creating three caches with different bucket sizes.

[c31] 31. A computer network that comprises:
one or more I/O devices configured to store data; and
multiple computers coupled together, wherein each of the multiple computers is configured to cache said data,
and
wherein each of the multiple computers is configured to monitor which computers in the network are configured to cache said data.

[c32] 32. The computer network of claim 31, wherein each of the multiple computers is further configured to determine a remote connection address for all other computers in the network that are configured to cache said data.

[c33] 33. The computer network of claim 32, wherein each of the multiple computers is further configured to send and receive targeted messages for maintaining cache coherency.

[c34] 34. The computer network of claim 31, wherein each of

the multiple computers is further configured to determine a list of computers in the network that are configured to cache said data, and is still further configured to update the list when a computer that is configured to cache said data joins the network.

[c35] 35. The computer network of claim 34, wherein each of the multiple computers is further configured to determine a remote connection address for each computer in the list, and is still further configured to maintain cache coherency by communicating targeted messages among said multiple computers.

[c36] 36. The computer network of claim 31, wherein the one or more I/O devices include one or more hard disk drives.

[c37] 37. A cache driver to be executed by each of multiple computers coupled together in a network with at least one I/O device configured to store data, the cache driver comprising:

a routine that configures each of said multiple computers to cache said data from said at least one I/O device;
and

a program that configures each of said multiple computers to monitor which computers in the network are configured to cache said data.

- [c38] 38. The cache driver of claim 37, wherein the program further configures each of said multiple computers to determine a remote connection address for all other computers in the network having said routine operable to cache said data.
- [c39] 39. The cache driver of claim 38, wherein said routine further configures each of said multiple computers to send and receive targeted messages for maintaining cache coherency.
- [c40] 40. The cache driver of claim 37, wherein the program further configures each of said multiple computers to: determine a list of computers in the network that are configured to cache said data; and update the list when a computer that is configured to cache said data joins the network.
- [c41] 41. The cache driver of claim 40, wherein the program further configures each of said multiple computers to determine a remote connection address for each computer in the list; and wherein the routine further configures each of said multiple computers to maintain cache coherency by communicating targeted messages among said multiple computers.
- [c42] 42. The cache driver of claim 37, wherein the at least

one I/O device comprises a hard disk drive.

[c43] 43. A method of caching, in a network having multiple computers and at least one I/O device, wherein each of the multiple computers has an associated system memory, wherein the at least one I/O device stores data, wherein the method comprises:
determining a list of computers in the network that are configured to cache said data;
updating the list when a computer joins the network;
determining a remote connection address for each computer in the list;
caching said data in the system memory of one or more of said multiple computers; and
maintaining cache coherency by communicating targeted messages among said multiple computers.

[c44] 44. The method of claim 43, wherein the at least one I/O device includes a hard disk drive.

[c45] 45. The method of claim 43, wherein said caching includes:
creating in each of the associated system memories at least two caches with different bucket sizes; and
caching in each of the two caches data from multiple files stored on the I/O device.

- [c46] 46. The method of claim 45, wherein said creating includes creating in each of the associated system memories three caches with different bucket sizes.
- [c47] 47. The method of claim 43, wherein said data is a single file, and wherein said caching includes:
creating in each of the associated system memories at least two caches with different bucket sizes,
wherein each cache is capable of storing a portion of said data.
- [c48] 48. The method of claim 14, wherein said creating includes creating in each of the associated system memories three caches with different bucket sizes.
- [c49] 49. A computer network that comprises:
one or more I/O devices configured to store data; and
multiple computers coupled together, wherein each of the multiple computers is configured to cache data from the one or more I/O devices,
wherein each of the multiple computers is configured to determine for each of the one or more I/O devices a list of computers in the network that are configured to cache data from that device.
- [c50] 50. The computer network of claim 49, wherein each of the multiple computers is further configured to deter-

mine a remote connection address for all other computers in each list.

[c51] 51. The computer network of claim 50, wherein each of the multiple computers is further configured to send and receive targeted messages to maintain cache coherency.

[c52] 52. The computer network of claim 49, wherein each of the multiple computers is further configured to update the lists when a computer joins the network.

[c53] 53. A cache driver to be executed by each of multiple computers, wherein the multiple computers are coupled together in a network that includes multiple I/O devices, wherein the cache driver configures each of the multiple computers to:

determine for each of the multiple I/O devices a list of computers in the network that are configured to cache data from that I/O device; and
update the lists when a computer joins the network.

[c54] 54. The cache driver of claim 53, wherein the cache driver further configures each of the multiple computers to:
determine a remote connection address for each remote computer in the lists.

[c55] 55. The cache driver of claim 54, wherein the cache driver further configures each of the multiple computers

to:

establish a communications channel with each remote computer in the sets.

[c56] 56. The cache driver of claim 55, wherein the cache driver further configures each of the multiple computers to:

enable communication of cache data invalidation messages via the communications channels.

[c57] 57. The cache driver of claim 53, wherein the cache driver further configures each of the multiple computers to:

cache, in system memory, data from one or more of the multiple I/O devices; and

maintain cache coherency by communicating targeted messages among said multiple computers.

[c58] 58. The cache driver of claim 53, wherein the I/O device is a hard disk drive.

[c59] 59. A method of caching in multiple computers data from one or more I/O devices coupled to a network, wherein the method comprises:

determining for each of the one or more I/O devices a list of computers in the network that are configured to cache data from that I/O device; and

updating the lists when a computer joins the network.

- [c60] 60. The method of claim 59, further comprising:
determining a remote connection address for each remote computer in the lists.
- [c61] 61. The method of claim 60, further comprising:
establishing a communications channel with each remote computer in the lists.
- [c62] 62. The method of claim 61, further comprising:
enabling communication of cache data invalidation messages via the communications channels.
- [c63] 63. The method of claim 60, wherein each of the multiple computers has an associated system memory, the method further comprising:
caching, in the associated system memories, data from one or more of the multiple I/O devices; and
maintaining cache coherency by communicating targeted messages among said multiple computers.